



## **Investigation into False Arsenic values in Puri Groundwater by ICP-OES Technique: Intercomparison Exercises and Responsible Factors for Analytical Error**

Tarit Roychowdhury\*

*National Environmental Engineering Research Institute, Nehru Marg, Nagpur 440020, Maharashtra, India*

*Received August 17, 2010; Accepted November 30, 2010*

**Abstract:** An investigation study was carried out on the reported false arsenic values in Puri groundwater samples generated by ICP-OES technique. The preservation, storage and time interval between collection and analysis of the samples were questionable according to the universally accepted practice for estimation of arsenic. About 90% of the samples were reported as arsenic-contaminated above 0.05 mg l<sup>-1</sup> (mean = 0.181 mg l<sup>-1</sup>, range = 0.03-0.45 mg l<sup>-1</sup>, n = 52). Arsenic concentrations in six water samples (range = 0.049-0.32 mg l<sup>-1</sup>) were cross-checked by the spectrophotometric Gutzeit method and FI-HG-AAS method, respectively during the investigation and the study results showed that none of the samples contained arsenic above 0.03 mg l<sup>-1</sup>. Whereas, the ICP-OES study further confirmed the presence of high concentration of arsenic in the samples. High concentrations of arsenic standards (1, 5 and 10 mg l<sup>-1</sup>) which were used for the preparation of calibration curve for arsenic estimation certainly created major errors during low concentration of arsenic analysis by ICP-OES technique. Blank value (intensity) was very high throughout the analysis which was increased rapidly with time. This was obviously due to instrumental noise. So, there was always a linear drift during the analysis. In the case of the samples having arsenic concentrations less than 0.05 mg l<sup>-1</sup>, the intensity (count per sec) was too high compared to the highly concentrated arsenic solution above 0.05 mg l<sup>-1</sup>. So, there was always a possibility of obtaining high concentration of arsenic (false value) for solutions with low arsenic concentration. Arsenic concentration in a proportion of samples in duplicate was different for different days. Even high variation was observed for the duplicate samples, analyzed on the same day. Preparation of appropriate standards for calibration, recovery test against spiking known concentration of sample, cross-checking the unknown concentration in duplicate samples, cross-checking by several analytical methods from the same/different laboratories, proper subject knowledge and efficiency or expertise of the chemical/instrumental analyst in a particular analytical field are integral parts to maintain the quality control and to achieve the good analytical results.

**Keywords:** *Groundwater; Preservation and storage; ICP-OES; False arsenic value; FI-HG-AAS; Gutzeit Method*

---

\* Corresponding: E-Mail: [t\\_roychowdhury@neeri.res.in](mailto:t_roychowdhury@neeri.res.in); Tel & Fax: 91-712-2249756,